

# Curriculum Vitae: Oliver Ruhnau

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## Short bio

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I am Assistant Professor for Energy Market Design at the University of Cologne and Research Scientist at the Institute of Energy Economics (EWI). My research interests lie in the field of energy economics and the sustainable transition of energy systems. In my dissertation, I investigated flexible electricity demand in current and future electricity markets, with a focus on heat pumps and hydrogen electrolysis. More recently, I studied natural gas savings in Germany during the energy crisis. I have (co-)developed several numerical energy market models and applied statistical methods for causal inference. Previously, I was Postdoctoral Researcher at the Hertie School in Berlin. I worked as a data scientist in the energy industry and studied engineering and economics at the RWTH Aachen University and the KTH Royal Institute of Technology in Stockholm.

## Positions

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| 2023 – present | <b>Assistant Professor of Energy Market Design at the <a href="#">University of Cologne</a></b><br>Faculty of Management, Economics and Social Sciences  |
| 2023 – present | <b>Research Scientist at the <a href="#">Institute of Energy Economics (EWI)</a> at the University of Cologne</b><br>Acquisition and implementation of research projects   |
| 2022 – 2023    | <b>Postdoctoral Researcher at the <a href="#">Hertie School</a></b><br>Centre for Sustainability   |
| 2019 – 2021    | <b>Research Associate at the Hertie School</b><br>Project: Model comparison for impact analysis of policy instruments (MODEX-POLINS)<br>Funder: German Federal Ministry of Economic Affairs and Energy (BMWi)    |
| 2017 – 2019    | <b>Data Scientist at Digital Energy Solutions by <a href="#">BMW</a> and <a href="#">Viessmann</a></b><br>Tasks: modelling and analysis of integrated energy systems and markets                                 |
| 2014 – 2017    | <b>Student Assistant and Internships</b><br>FCN Institute for Future Energy Consumer Needs and Behavior (Aachen)<br>BET Büro für Energiewirtschaft und technische Planung (Aachen)<br>Grundgrün Energie (Berlin) |

## Education

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| 2019 – 2022 | <b>Doctoral Program in Governance at the <a href="#">Hertie School</a></b><br>Title: “Economics of flexible electricity demand”<br>Supervisors: Lion Hirth, Christoph Weber, Ottmar Edenhofer<br>Grade: summa cum laude |
| 2015 – 2017 | <b>Master of Science at <a href="#">RWTH Aachen</a></b><br>Engineering and economics (Wirtschaftsingenieurwesen)<br>Focus: energy systems, energy economics, renewable energy<br>Grade: excellent (1.3)                 |
| 2011 – 2015 | <b>Bachelor of Science at RWTH Aachen</b><br>Grade: excellent (1.3)   |

## Teaching

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2023 – present	<b>Assistant Professor the <a href="#">University of Cologne</a></b> Lecture: Energy Markets & Regulation Seminar: Energy Market Design
2022 – 2023	<b>Lecturer at <a href="#">Hertie School</a></b> Course: Net-Zero Energy Systems
2022	<b>Guest lecturer at the <a href="#">German Academic Scholarship Foundation (Studienstiftung)</a></b> Summer School: Net-Zero Energy Systems (w/ Maren Preuß)
2020 – 2022	<b>Teaching Assistant at Hertie School</b> Courses: Energy Economics, Electricity Market Design (w/ Lion Hirth)
2021	<b>Training Participant at Hertie School</b> Certificate: Introduction to Teaching in Higher Education (by Annika Zorn)
2020	<b>Guest Lecturer at <a href="#">TU Berlin</a></b> Course: Electricity Economics and Modeling (w/ Anselm Eicke)
2012 & 2016	<b>Teaching Assistant at <a href="#">RWTH Aachen</a></b> Decision Theory at <a href="#">EFI Chair of Decision Theory &amp; Financial Services</a> (w/ Rüdiger v Nitsch), Energy System Technology at <a href="#">LTT Institute of Technical Thermodynamics</a> (w/ André Bardow)

## Advising

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2023 – today	<b>At the University of Cologne</b> Dissertations: 12x second advisor, 3x referee Master theses: 3x first advisor
2020 – 2023	<b>At the Hertie School</b> Master theses: 8x second advisor

## Funding

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2022	<b>Project funding from the <a href="#">Federal Ministry of Education and Research (BMBF)</a></b> Title “Machine Learning for Electricity Market Research” (w/ Lion Hirth and Lynn Kaack)
2020 – 2021	<b>Stipend from the <a href="#">German Economy Foundation (Stiftung der Wirtschaft)</a></b>
2013 – 2017	<b>Stipend from the <a href="#">German Academic Scholarship Foundation (Studienstiftung)</a></b>
2013	<b>Stipend from the <a href="#">Ulderup Foundation</a></b>

## International

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2021	<b>Research visit at European University Institute’s <a href="#">Florence School of Regulation</a></b>
2013	<b>Study abroad at <a href="#">KTH Royal Institute of Technology</a></b>
2007 & 2009	<b>Student exchanges with France and Canada</b>

## Honors

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2021	<b>2<sup>nd</sup>-Best Student Paper Award from the <a href="#">International Association for Energy Economics</a></b>
2017 & 2019	<b>Finalist at awards from the <a href="#">German Association for Energy Economics</a></b>
2013 – 2015	<b>Dean's List at RWTH Aachen (Top 5%)</b>

## Initiatives

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2022 – present	<b>Co-Director of <a href="#">Strommarkttreffen</a></b> Network for professionals in energy
2020 – 2021	<b>Founding member of the <a href="#">d\carb – Future Economy Forum</a></b> Organizing public events on the transition toward a sustainable economy
2013 – 2017	<b>Member of <a href="#">Energie Forum Aachen e.V.</a></b> Organizing public events on energy topics
2012 – 2017	<b>Member of the Board at <a href="#">Hêvi e.V.</a></b> Local association for education and integration
2009 – 2010	<b>President of the Student Council</b>

## Research interests

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**Energy economics**, energy policy, electricity markets (wholesale, retail, balancing), market design, tariff design, market regulation, carbon pricing

**Integrated energy systems**, wind and solar energy, energy storage, flexible electricity demand, sector coupling, electrification, electric vehicles, electric heat pumps, hydrogen, net-zero energy systems

**Numerical and empirical methods**, energy market modeling, linear optimization, partial equilibrium models, causal inference, instrumental variables

## Publications

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[Google Scholar](#)

### Full peer-review

1. Ruhnau, O., Stiewe, C., Muessel, J., Hirth, L., 2023. **Natural gas savings in Germany during the 2022 energy crisis**. *Nature Energy*. (presented at FSR Insights 2023, ENERDAY 2023)
2. Ruhnau, O., Schiele, J., 2023. **Flexible green hydrogen: The effect of relaxing simultaneity requirements on project design, economics, and power sector emissions**. *Energy Policy*. (presented at the FSR Annual Sustainability Conference 2022)
3. Muessel, J., Ruhnau, O., Madlener, R., 2023. **Accurate and scalable representation of electric vehicles in energy system models: A virtual storage-based aggregation approach**. *iScience*. (presented at the Smart Energy Systems Conference 2023)
4. Ruhnau, O., 2022. **How flexible electricity demand stabilizes wind and solar market values: The case of hydrogen electrolyzers**. *Applied Energy*. (2<sup>nd</sup>-Best Student Paper at the IAEE 2021, presented at INREC 2020, IEW 2021, EAERE 2021, EMP-E 2021, BTU 2022)
5. Ruhnau, O., Qvist, S., 2022. **Storage requirements in a 100% renewable electricity system: Extreme events and inter-annual variability**. *Environmental Research Letters*. (presented at IEW 2022)

6. Ruhnau, O., Eicke, A., Sgarlato, R., Tröndle, T., Hirth, L., 2022. [Cost-potential curves of onshore wind energy: the role of disamenity costs](#). *Environmental and Resource Economics*. (presented at IAEE Webinar 2023, EGU 2023)
7. Ruhnau, O., Bucksteeg, M., Ritter, D., et al., 2022. [Why electricity system models yield different results: Carbon pricing in a model-comparison experiment](#). *Renewable and Sustainable Energy Reviews*. (presented at ENERDAY 2021, OR 2021, IAEE Webinar 2022)
8. Cloete, S., Ruhnau, O., Cloete, J.H., Hirth, L., 2022. [Blue hydrogen and industrial base products: The future of fossil fuel exporters in a net-zero world](#). *Journal of Cleaner Production*.
9. Pöstges, A., Bucksteeg, M., Ruhnau, O., et al., 2022. [Phasing out coal: An impact analysis comparing five large-scale electricity market models](#). *Applied Energy*.
10. Bucksteeg, M., Wiedmann, M., Pöstges, A., et al., 2022. [The transformation of integrated electricity and heat systems—Assessing mid-term policies using a model comparison approach](#). *Renewable and Sustainable Energy Reviews*.
11. Eicke, A., Ruhnau, O., Hirth, L., 2021. [Electricity balancing as a market equilibrium: An instrument-based estimating supply and demand for imbalance energy](#). *Energy Economics*.
12. Cloete, S., Ruhnau, O., Hirth, L., 2021. [On capital utilization in the hydrogen economy: The quest to minimize idle capacity in renewables-rich energy systems](#). *International Journal of Hydrogen Energy*.
13. Ruhnau, O., Hirth, L., Praktijnjo, A., 2020. [Heating with wind: Economics of heat pumps and variable renewables](#). *Energy Economics*. (presented at YEEES 2019, INREC 2019)
14. Ruhnau, O., Hennig, P., Madlener, R., 2020. [Economic implications of forecasting electricity generation from variable renewable energy sources](#). *Renewable Energy*. (presented at OR 2015)
15. Ruhnau, O., Hirth, L., Praktijnjo, A., 2019. [Time series of heat demand and heat pump efficiency for energy system modeling](#). *Scientific Data*.
16. Ruhnau, O., Bannik, S., Otten, S., Praktijnjo, A., Robinius, M., 2019. [Direct or Indirect Electrification? A review of heat generation and road transport decarbonisation scenarios for Germany 2050](#). *Energy*.

#### Working papers & works in progress

17. Hirth, L., Khanna, T., Ruhnau, O., 2023. [How aggregate electricity demand responds to hourly wholesale price fluctuations](#). *Working paper*. (presented at INREC 2021, ESEE Pisa 2022, EMEE 2022, IAEE 2023)
18. Casas Ferrús, M. N., Ruhnau, O., Madlener, R., 2023. [Portfolio effects in green hydrogen production under temporal matching requirements](#). *Working paper*.
19. Stiewe, C., Ruhnau, O., Hirth, L., 2022. [European industry responds to high energy prices: The case of German ammonia production](#). *Working paper*.
20. Ruhnau, O., Muessel, J., 2022. [Update and extension of the When2Heat dataset](#). *Working paper*.

#### Conference proceedings, dissertation & book chapters

21. Ruhnau, O., Lundström, L., Dürr, L., Hunecke, F., 2023. [Empirical weather dependency of heat pump load: Disentangling the effects of heat demand and efficiency](#). *19<sup>th</sup> International Conference on the European Electricity Market*.
22. Muessel, J., Ruhnau, O., Madlener, R., 2023. [Simulating charging behavior of electric vehicles: Review and comparison with empirical data](#). *19<sup>th</sup> International Conference on the European Electricity Market*.
23. Ruhnau, O., 2022. [The Economics of Flexible Electricity Demand](#). *Dissertation*.
24. Madlener, R., Ruhnau, O., 2021. [Variable renewables and demand flexibility: Day-ahead versus intraday valuation](#). In: Sioshansi, F., Variable Generation, Flexible Demand. *Academic Press*.

#### Software & data

25. Hirth, L., Ruhnau, O., Sgarlato, R., 2021. [The European Electricity Market Model EMMA](#). *Open-source electricity market model, including input data*.

26. Ruhnau, O., 2019. [When2Heat Heating Profiles](#). Dataset contributed to the Open Power System Data platform.

#### Commentaries

27. Hirth, L., Maurer, C., Ruhnau, O., et al., 2022. [Energy policy and energy industry options for Germany and Europe in view of Russia's attack on Ukraine](#). Open letter at *Tagesspiegel Background Energie & Klima*.
28. Osorio, S., Pahle, M., Ruhnau, O., 2022. [If buildings renovation fails, the EU ETS pricing mechanism must change](#). *energypost.eu*.

## Review service

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Academic journals: *Applied Energy*, *Data in Brief*, *Economica*, *Energy Economics*, *The Energy Journal*, *Energy Policy*, *Energy Strategy Reviews*, *IET Renewable Power Generation*, *iScience*, *Joule*, *Nature Communications*, *Nature Communications Earth and Environment*, *Nature Energy*, *Resource and Energy Economics*

Grant proposals: [Climate Change AI Innovation Grants](#)

Policy Statements: [Hydrogen Analysis by the Copernicus Research Project Ariadne](#), [Hydrogen Statement by German Advisory Council on the Environment](#) (Sachverständigenrat für Umweltfragen)

## Selected media coverage

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#### Written

*Frankfurter Allgemeine Zeitung*, 2023: [Warum sich die Lage auf dem Gasmarkt entspannt](#)

*Tagesspiegel*, 2023: [Gasverbrauch ist in Deutschland 2022 stark zurückgegangen](#)

*Financial Times*, 2022: [Germany dims the light to cope with Russia gas supply crunch](#)

*Spiegel*, 2022: [Wer in Deutschland Gas spart – und wer nicht](#)

*Zeit Online*, 2022: [So schlimm könnte der Gasstopp werden](#)

*WirtschaftsWoche*, 2022: [„Die Ignoranz gegenüber Preissignalen rächt sich schon jetzt“](#)

*Tagesspiegel Background Energie & Klima*, 2022: [Studie belegt Spareffekt hoher Gaspreise](#)

*Handelsblatt*, 2022: [Atomkraftwerke sind die einzige Chance, die Energiewende noch zu schaffen](#)

#### Radio & podcast

*BBC Radio*, 2022: [World Business Report on July 8](#)

*Terra-X – der Podcast (ZDF)*, 2022: [Wie gefährdet ist unser Stromnetz?](#)

*Hessischer Rundfunk (hr-info)*, 2022: [Aktuell um 15:00 am 1. August zum Gas-Notfallplan der EU](#)

#### Television

*ARD*, 2023: [Tagesschau am 5. Mai um 20:00](#)

*ntv*, 2022: [Telebörse um 12:15 am 1. November \(live\)](#)

## Selected talks

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#### Invited speaker & panelist

*Energy Economics Institute (EWI) at the University of Cologne*, 2023: [EWI Insights and Energiewirtschaftstagung](#)

*Florence School of Regulation*, 2023: [FSR Insights on Experience with Emergency Gas Measures](#)

*German Marshall Fund of the United States*, 2022: [The Winter of Discontent. Europe's Energy and Economic Crisis](#)

*World Energy Council's Young Energy Professionals*, 2022: [Energy markets and state intervention in times of crisis](#)

#### Conferences

International Association of Energy Economics (IAEE), Annual Conference 2021, 2023, Webinar 2021, 2022, 2023

Smart Energy Systems (SES) Conference, Copenhagen 2021, 2023

European Energy Markets (EEM) Conference, Lappeenranta 2023

ENERDAY, Online 2021, Dresden 2023

International Energy Workshop (IEW), Freiburg 2022

Empirical Methods in Energy Economics (EMEE), Online Summer Workshop 2022

European Association of Environmental and Resource Economists (EAERE), Online 2021

Energy Modeling Platform for Europe Conference (EMP-E), Online 2021

Operation Research Conference (OR), Online 2021